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Department of Water, Land and Biodiversity Conservation

FORESTRY WATER USE SCENARIOS FOR MT. LOFTY RANGES AQUIFERS

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INTRODUCTION

The prescription of the water resources of the Mt Lofty Ranges (MLR) under the *Natural Resources Management Act 2005* has the highlighted the need to take into account water use by forestry in the sustainable allocation of water resources and the protection of water dependent ecosystems. The following principals were discussed and agreed upon at a meeting of experts on 14th November, 2007. The attendees were:

DWLBC	CSIRO
Paul Moran	Fred Leaney
Scott Donner	Lu Zhang
David Trebilcock	Richard Benyon
David Cresswell	
Kumar Savadamuthu	Forestry SA
Steve Barnett	Don Mcguire
Graham Green	
Darryl Harvey	

RESEARCH IN THE LOWER SOUTH EAST

When taking into consideration the whole of life of typical plantations it was concluded that recharge under pine plantations was 17%, and 22% under blue gum plantations compared to pasture or shallow rooted crops. In other words, on average, pine plantations reduced recharge by 83% and blue gum plantations by 78%. These were outcomes of the initial work in 2001 (Parliament of South Australia, 2001). The models were revised in 2006 against a redefined plantation rotation lengths and calendar. The revision resulted in a change to the blue gum annualised impact from 23 % to 22 % or alternatively, blue gums prevent 78% of the recharge that would normally occur under a dryland pasture and agricultural cropping landscape.

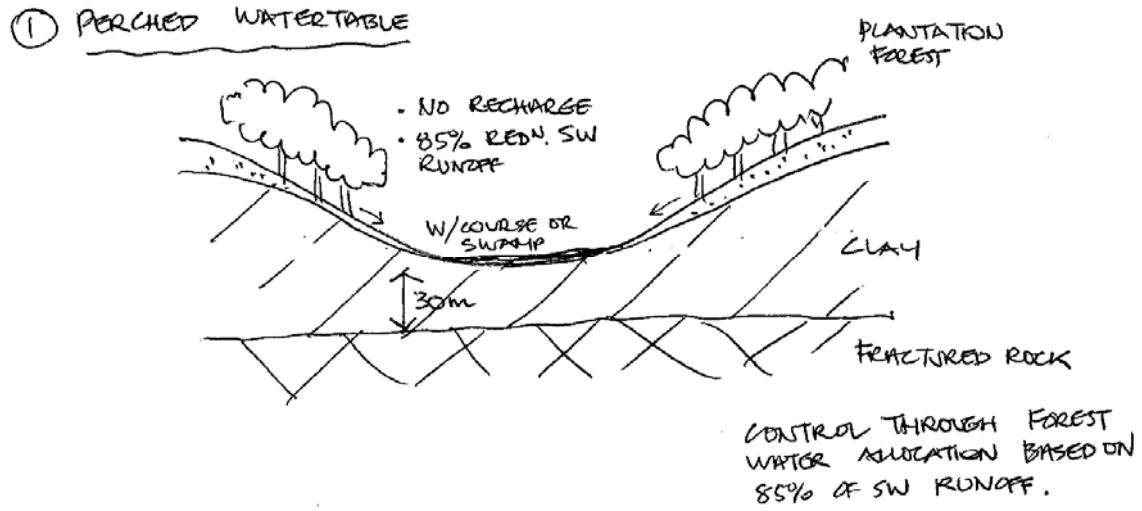
Research on direct water use was carried out by CSIRO (Benyon and Doody, 2004). The agreed annualised rate of extraction for blue gum plantations is 1.82 ML/ha/y and for pine plantations is 1.66 ML/ha/y where watertables are less than a median 6 m depth (South East NRM Board, 2006). It was agreed that the South East research on reduced recharge under plantation forestry was not applicable to the MLR because the fractured rock aquifers are different from the sedimentary limestone aquifers in the South East. However, the research on direct extraction from shallow water tables was considered applicable in the Permian Sands areas of the Southern Fleurieu.

RESEARCH IN THE MT LOFTY RANGES

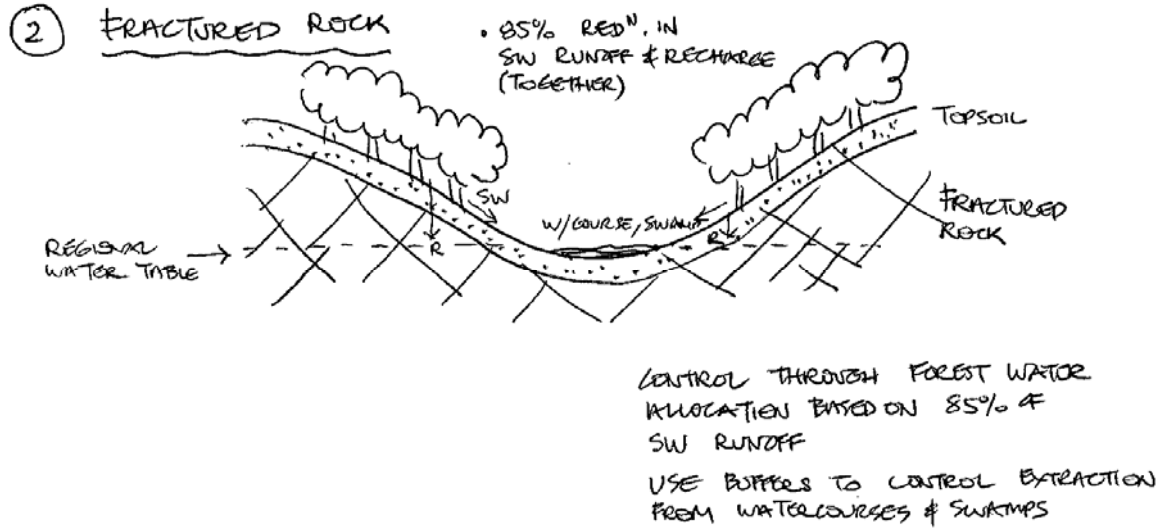
Research on surface water runoff from pine forestry catchments based on the Burnt Out Creek Study in the Onkaparinga Catchment (Greenwood and Cresswell, 2007) concluded that on average over the whole life of the forest, pine plantations reduce streamflow by 85% compared to clear-felled catchments. This is very similar to the 83% reduced recharge found to occur under pine plantations in the South East. It was agreed that this research is most relevant to the MLR due to the predominant fractured rock aquifer. It was also agreed that reduction in recharge cannot be meaningfully separated from reduction in surface water runoff and that it should be included in the 85% reduction in streamflow (which includes baseflow, a component of streamflow along with surface water runoff).

AQUIFER SCENARIOS IN THE MT LOFTY RANGES

(1) Perched water tables are commonly found in the Fleurieu Peninsula, and are characterised by a layer of weathered basement clay (approximately 30 m deep) over fractured rock aquifers. It was agreed that reduction in recharge is not an issue here because the clay is impermeable and almost all rainfall becomes surface water runoff, or subflow (water moving through sandy soils above the thick clay layer. The deemed impact of plantation forestry is estimated to be a reduction of 85% of total surface water runoff at closed canopy for the catchment or subcatchment concerned.

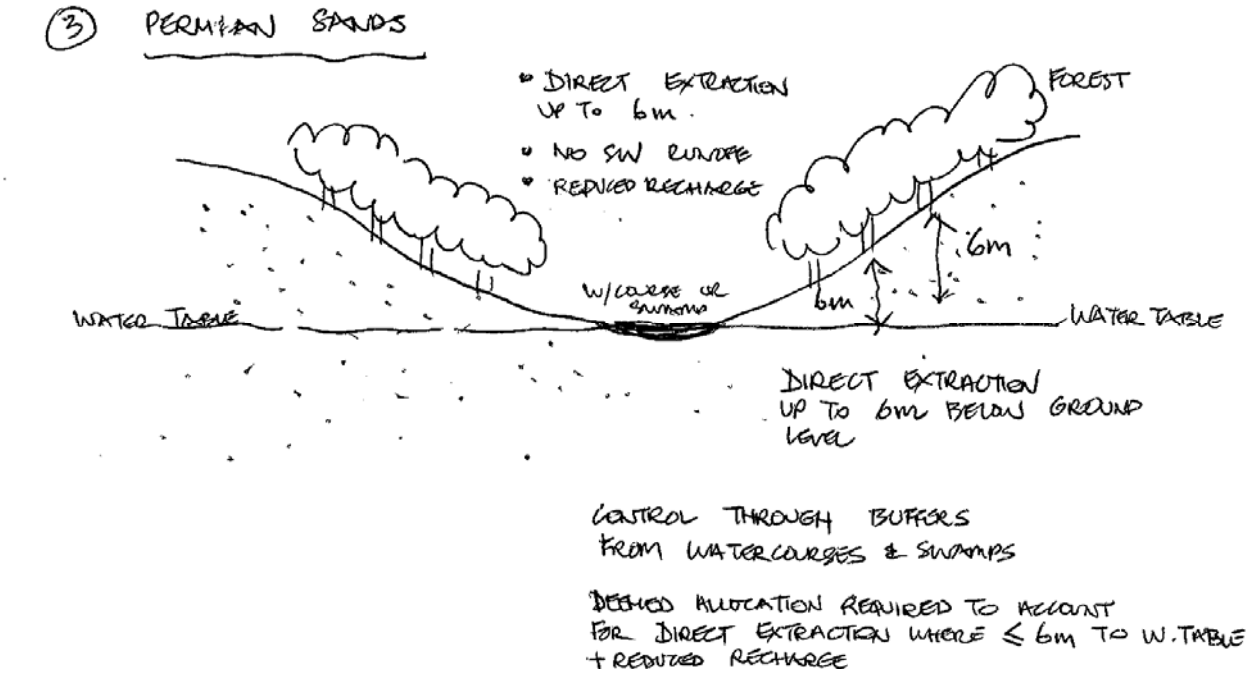


(2) Fractured rock aquifers are the most common type of aquifer in the MLR (apart from the Willunga Basin) and are characterised by a thin topsoil layer over permeable fractured rock. In these locations, reductions in recharge and surface water runoff would both occur but cannot be meaningfully separated. The deemed impact of plantation forestry is estimated to be a reduction of 85% of total surface water runoff at closed canopy for the catchment or subcatchment concerned (calculated as total rainfall multiplied by runoff coefficient, adjusted to remove influence of reservoirs and dams). Buffers and other plantation design criteria (protection of drainage lines) would be required to ensure no direct extraction from swamps, watercourses or wetlands by lateral roots of trees (50 metre setback suggested). Because of the relatively steep topography, these buffers would also minimise the impact of direct extraction from the watertable because of the increased depth to the watertable and the presence of root impeding layers.



(3) Permian Sands aquifers are encountered in broad valleys in the southern MLR and support critically endangered Fleurieu Swamps and wetlands. They are characterised by watertable aquifers consisting of varying depths of sand that contain very low salinity groundwater which widely used for irrigation as well as the Mt Compass town supply. Where these watertables are 6 m or less below ground plantation forests will directly extract water unless an impermeable (hardpan) layer exists between the water table and the tree roots. The agreed annualised rate of extraction for blue gum plantations is 1.82 ML/ha/y and for pine plantations is 1.66 ML/ha/y based on the South East research.

Because of the highly permeable nature of the aquifer, there would be minimal surface water runoff. However, plantation forests would nevertheless reduce the rate of natural recharge. The deemed impact is calculated as a reduction of 85% of total surface water runoff at closed canopy (calculated as total rainfall multiplied by runoff coefficient, adjusted to remove influence of reservoirs and dams). An underground water allocation would be required to account for both reduced recharge and direct extraction.



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